BCI (S2021) - MID SEM EXAM- Set-C

Total points 7/10

Course Name: Brain Computer Interaction (BCI)
Exam Duration: 1 hour
Total Marks: 25

Instructions:
1. This is a closed book, closed notes exam.
2. You should not discuss questions or answers with anyone (including outsiders)
3. You should have your camera ON at at all times and no headphones
4. Consists of Part-A and Part-B. Part-A consist of 3 descriptive questions. and Part-B consist of 10 MCQ questions
5. For descriptive questions, write down your answers in A4 sheet. And be brief and to-the-point. Answers must be given in ball point pen only. Answers in pencils will not be checked.
6. You should submit the scanned copy of your answer sheet for the respective question only. Don't submit the answer of other question For Ex: Q1 answer should be submitted for Q1 only. Please be careful while uploading the answers.
7. The name of the scanned copy should be the Roll No + '_' + Set No.pdf. (e.g.,S20170010XYZ_SetC.pdf).
Write the name and the roll no. on each page of the answer sheets.
8. Follow all other instructions given by the faculty during the exam. Attempt all questions

Descriptive Type Questions

0 of 0 points

Each Question in this section are of 5 Marks= 5*3=15

Write down your answers in A4 sheet. And be brief and to-the-point. Answers must be given in ball point pen only. Answers in pencils will not be checked.

You should submit the scanned copy of your answer sheet for the respective question only. Don't submit the answer of other question For Ex: Q1 answer should be submitted for Q1 only.

Please be careful while uploading the answers.

Describe What component of neural activity does EEG measure? Describe the frequency range and brain phenomena associated with the following EEG waves. a. Alpha b. Beta

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Describe the sequence of events that gives rise to an action potential. Start from a volley of action potentials arriving along the input axons to the neuron and trace the biochemical and electrical consequences leading to an output action potential.

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Compare and contrast fNIR imaging with fMRI for recording brain activity.

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Multiple Choice Questions

7 of 10 points

MCQ Questions (10*1 = 10)

✓ EEG rhythm that is found over sensorimotor areas in the absence of movement and is decreased or abolished when the subject performs a movement or imagines performing a movement 1/1

- Delta wave
- Alpha wave
- Beta wave
- Mu wave ✓

✓ The artifact that is predominant in concurrent EEG-fMRI acquisition 1/1

- ○ Eye blink
- ◉ ballistocardiogram ✓
- ○ Muscle movements
- ○ chewing

✗ The invasive optical techniques for imaging neuronal activities are 0/1

- ☑ voltage-sensitive dyes ✓
- ☑ two-photon fluorescence microscopy ✓
- ☑ optical multielectrode Arrays ✗
- ☑ All of the above ✗

Correct answer

- ☑ voltage-sensitive dyes
- ☑ two-photon fluorescence microscopy

✓ Match the following 1/1

A) fMRI	1) SQUID
B) PET	2) BOLD
C) MEG	3) optodes
D) fNIR	4) radiotracer

- (●) A – 2, B – 4, C – 1, D - 3 ✓
- ( ) A – 2, B – 3, C – 4, D - 1
- ( ) A – 2, B – 1, C – 4, D - 3
- ( ) A – 3, B – 1, C – 4, D - 2

✓ The poor spatial resolution of EEG is caused primarily due to 1/1

- (●) different layers of tissue such as meninges, cerebrospinal fluid, skull and scalp ✓
- ( ) artifacts generated by muscle activity
- ( ) good temporal resolution
- ( ) varying psychological states of the user

✓ The part of the brain known to be critical for memory and learning 1/1

- (●) hippocampus ✓
- ( ) hypothalamus
- ( ) medulla and pons
- ( ) thalamus

✓ Find the odd one out regarding aqueous medium of neurons. 1/1

- ( ) Potassium (K+)
- (●) Hydrogen (H+) ✓
- ( ) Sodium (Na+)
- ( ) organic anions (A-)

✗ Bipolar electrodes are 0/1

- ( ) where the potential of each electrode is compared to a neutral electrode
- (●) where the potential of each electrode is compared to the average of all electrodes ✗
- ( ) where the potential difference between a pair of electrodes is measured
- ( ) Both A and B

Correct answer

- (●) where the potential difference between a pair of electrodes is measured

✗ How many complex multiplications are need to be performed for each FFT algorithm? 0/1

- ○ (N/2) log N
- ◉ N log N ✗
- ○ N log_2 N
- ○ (N/2) log_2 N

Correct answer

- ◉ (N/2) log_2 N

✓ Rapid influx of Na+ ions and outflux of K+ions in the cell causes 1/1

- ○ membrane potential to rise rapidly
- ○ no change in membrane potential
- ◉ rapid rise and fall of the membrane potential ✓
- ○ membrane potential to drop rapidly